

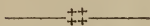
UNIVERSITY OF CALIFORNIA.

AGRICULTURAL EXPERIMENT STATION.

BERKELEY, CAL.

E. W. HILGARD, Director.

BULLETIN NO. 102



ANALYSES OF FIGS AND FIG SOILS.

The growing importance of the fig industry in California calls for a full investigation of this fruit, in order to determine as quickly as possible the peculiarities of each variety as grown in the different sections of the State, and thus to gain an insight into their probable commercial adaptations, as well as their nutritive values. In accordance with this plan, already outlined and exemplified with respect to other fruits in bulletins 93, 97 and 101 of this station, such figs as were obtainable of the crop of 1892 have been examined and are here reported upon. The comparatively limited number of samples received thus far does not justify an extended discussion of the practical bearings of the results; yet the fact that they embrace a few of the most important varieties, as well as a number of new ones grown at the University Experiment Stations, lends interest to them. Marked differences will be noted particularly as regards the proportions of juice, sugar and acid, as well as in the nitrogen contents which so essentially determine the nutritive value; points of direct importance to the grower as well as to the consumer. The farmer is also specially interested in the amount and kind of ash ingredients and nitrogen taken from the soil by the fruit, since these represent what sooner or later will have to be replaced by fertilization, according to the character of the soil

selected for the orchard. In this connection the result of the examination of typical soils that for ages have been used in the production of the best figs of commerce presents great interest, since we are thus enabled to compare them with those of this State that have been or are likely to be used in fig-growing, thus gaining a definite basis for their selection.

Producers of these fruits are again invited to communicate with the station in regard to the examination of their product during the coming season.

E. W. H.

Description of Figs Received.

No. 1, *White Adriatic*, from Fresno, name of grower not obtained; sample received on Aug. 19th. Condition, good; color, greenish yellow; fruit very tender, fairly juicy and very sweet; a typical fruit of its kind.

No. 2, *White Adriatic*, Kern Co.—Grower, Geo. A. Raymond; sample received Sept. 2d. A large fruit; in excellent condition; delicate, juicy and very sweet fleshed; color, almost cream yellow. On pp. 5 and 6 will be seen a description and analysis of the soil upon which these figs were grown.

No. 3, *Smyrna* (?), Solano Co.—E. R. Thurber, grower; sample received Aug. 6th. Condition, good; a medium sized fruit; color, dark yellow; flesh, not very tender or sweet.

No. 4, *Smyrna Bulletin*, Tulare Co.—Grower, San Joaquin Valley Experiment Station; sample received Aug. 17th. A much smaller but sweeter fruit than No. 3; coarse-fleshed;

color good. This fruit is from young trees and is marked as frost-proof.

No. 5, *California Black, Solano Co.*—E. R. Thurbur, grower; sample received Aug. 6th. Condition, good; a medium sized fruit with coarse flesh and rather hard; tough skin, taste not very sweet.

No. 6, *Hirtu du Japon, Tulare Co.*—Grower, San Joaquin Valley Experiment Station; sample received Aug. 17th. Condition, only fair; size, medium; color, purple; flesh, white in color, tender; juicy and quite sweet. A prolific bearer and frost-proof. Trees young.

No. 7, *Constantine, Tulare Co.*—Grower, San Joaquin Valley Experiment Station; sample received Aug. 17th. Condition, good; size, small; color, striped green and purple; flesh, hard and fibrous, but quite sweet; sample from young trees; another frost-proof variety at Tulare.

No. 8, *Du Roi, Tulare Co.*—Grower, San Joaquin Valley Experiment Station; sample received August 17th. Condition, good; color, cream; fully ripe; flesh hard and rather dry; taste, quite sweet. A new variety which also proves its ability to withstand frost; from trees young.

No. 9, *Doree Narbus, Tulare Co.*—San Joaquin Valley Experiment Station, grower; sample received Aug. 17th. A very small fruit; condition, good, but flesh dry and tough, although very sweet; variety, frost-proof (hardest of 54 varieties at the station); sample grown on young trees.

No. 10, *Pasteliere, Tulare Co.*—San Joaquin Valley Experiment Station, grower; sample received Aug. 17th. Condition, only fair; size, small; flesh, fibrous and rather tough, although quite juicy and sweet; variety frost-proof; sample from young trees.

No. 11, *Brunswick, San Luis Obispo Co.*—Sinsheimer Bros., growers; sample received Oct. 25th. A very large fig of dark color and tender, juicy flesh; taste, very sweet.

Soil of Nos. 4, 6, 7, 8, 9, 10, see pages 5 and 6.

The large table, page 4, shows the results of the analytical work for the season 1892; subdivision A gives the physical and proximate analyses; B, the analysis of the ash of White Adriatic and Smyrna fig.

In this table it will be noted that we have not tried to draw any averages, for the reason that the number of samples is too small to justify it. We will, however, in a brief way point out and discuss a few of the data.

PROPORTION OF JUICE TO PULP IN THE FRUIT.

The *juiciest* fruit—No. 2, White Adriatic, has over 85 per cent. juice; that of No. 11—Brunswick—with 82, and No. 6—Hirtu du Japon—with 80.6, being the only ones which nearly approach it. The *driest* sample—No. 4, Smyrna (*Bulletin*)—contains but 64 per cent. juice. The pulp as here given contains the skin and seeds as well as the pressed flesh.

SUGAR AND ACID CONTENTS OF THE JUICE AND FRUIT.

The determination of sugar is confined to the total amount of that substance, no effort having as yet been made to find the proportion of the different sugars (dextrose, levulose, cane sugar, etc.) in these fruits, for lack of time.

On the whole fruit, the highest sugar is seen in No. 2, White Adriatic; however, the juice of

No. 4, Smyrna, shows 29.90 per cent sugar, which when referred to the fresh fruit is still over one per cent. less than that of the White Adriatic, or as 19.20 to 20.45 per cent. No. 9, Doree Narbus, and No. 7, Constantine, with respectively 27.40 and 24.04 per cent sugars in their juice, show, on account of their dry flesh, much less sugar, on whole fruit, than either of the Adriatics. No. 3 Smyrna (?), has the lowest sugar percentage, amounting to but 8.0, on the whole fruit; some 4.5 per cent less than the California Black (No. 5) with 12.40.

European data at hand do not give any report upon fresh figs, but from the German analyses of dried figs it is easy to calculate, approximately, that the sugar in the whole fresh fruit amounts to about 20.00 per cent., thus showing no advantage over our largely grown White Adriatic figs in sugar contents.

The table below makes it evident that among California fruits, the *figs*—White Adriatic especially—hold no mean place in sugar contents.

PERCENTAGES OF SUGAR AND ACID.

No. of Analyses.	FRUITS.	JUICE.		Flesh.	Whole fr't.
		Acid.	Per Ct.	Sugars, Per Cent.	
2	Figs, White Adriatic	.15	23.90	19.20
9	Other figs, fm Tulare	.10 to .21	10 to 29	19.20
11	Apricots	.68	13.31	11.93	11 10
13	French Prunes	.31	23.69	19.70	18 53
33	Plums	.48	17.9	13.25	12 89
2	Peaches	.24	17.00	13.40	12 50
	Grapes	.50	24.00	23.06	20.70
80	Oranges	1.28	10.68	7.12	5.40

The *acid* of the figs, expressed in terms of sulphuric (SO₃) for the sake of comparison, seems thus to be very much lower than that found in any of our other fruits.

NUTRITIVE VALUES—NITROGEN CONTENTS.

Without repeating what has already been published by this Station in its fruit bulletins, Nos. 93, 97 and 101, relative to the importance of the *flesh-forming ingredients (albuminoids)* of our fruits, we give below, in tabular view, the average amounts of these materials contained in some of the fruits we have examined and considered. Added to this are such data from European sources as are at hand.

AVERAGE PERCENTAGES OF ALBUMINOIDS.

FRUITS.	No. of Analyses.	In Whole Fruit— Total.....	In the Fresh Flesh, or Edible Portion.	In Fresh Pits or Rind.
			Calculated to Whole Fresh Fruit,	
FIGS.				
California—				
White Adriatic.....	2	1.50	(1.50)
Others.....	6	1.20	(1.20)
European.....		1.42	(1.42)
ORANGES.				
California.....	35	1.14	.76	.38
European (Sicilian).....		1.78		
APRICOTS.				
California.....	11	1.25	1.088	.162
European.....		.49		
PRUNES.				
California.....	20	1.012	.837	.175
European.....		.780		
APPLES AND PEARS.				
European.....		.375		

As heretofore pointed out in bulletin 101, the *fig* rates *first* in flesh-forming materials among our fruits; apricots and plums, *second*; prunes and oranges, *third*.

It is interesting to reproduce, at this point, a summary of the *food constituents* of some of our dried fruits as compared with the dried fig—results already published in bulletin No. 101. In addition, the analysis of a sample of California raisin is here reported.

PERCENTAGE COMPOSITION OF DRIED FRUITS.

CONTENTS.	PER CENT.					
	French Prunes.	Apricots.	Raisins..	Figs	Figs	Apples..
	Dried.					(European)..
	Edible Por- tion.					
Water.....	25.20	32.44	18.95	25.00	21.06	33.00
Ash.....	1.50	1.38	1.55	2.24	1.8	1.40
Albuminoids (Crude Protein).....	2.80	2.90	4.00	4.50	4.06	1.70
Crude Fiber.....						8.30
Nitrogen—free extract.....	29.77	32.18	2.3	10.11	10.18	21.60
Fat.....						
Sugar	40.53	29.19	72.50	57.60	62.50	32.00
Free Acid, calculated as Sulphuric (SO ₂)	.40	1.51	.70	.45	.40	2.00
Total.....	100.00	100.00	100.00	100.00	100.00	100.00

*Samples from the vineyard of Prof. R. H. Lougbridge, Woodland California.

†Analyzed at this Station.

As stated in previous fruit bulletins, these results are too meager to serve as the basis for a general discussion of the relative food values of the fruits examined. However, we note some wide differences among the nutrients. For instance, the sugars and albuminoids, or crude protein, show considerable variation; the apricots, like the apples, yielding less than one-half as much sugar as the Muscat raisin, which contains nearly twice as much sugar as the prunes and 1½ times as much of that substance as the fig. European analyses of raisins show figures for sugar contents which differ but little from those we give here. Both raisins and figs, with respectively 4 and 4.5 per cent. albuminoids (flesh-forming materials), stand from 1½ to 2 times above the other fruits in this respect. The fig yields nearly twice as much ash as the other fruits here reported.

ASH COMPOSITION AND NITROGEN CONTENTS.

According to previous bulletins relating to fruits (Nos. 93, 97 and 101), the fig stands *second* in amount of mineral matter withdrawn from the soil for equal weights of the various fruits. From European data we place grapes *first* in this respect, and from our own findings the orange *third*, and the prune, apricot and plum, *fourth*. We report, in the large table on p. 4, an ash analysis of the White Adriatic fig from Kern county, and as the figures there represent a considerable district, we can take them as a fair guide, the analysis of the ashes of other fruits from different localities in California having shown that the variations will not be great enough to vitiate the conclusions. But few European analyses of fig ashes are at hand and their great discrepancies

necessitate an analysis by us of the ash of an *imported* fig. The results obtained are given in the accompanying tables, and it will be noted that the figures agree, within the limits to be expected, with those we report for our figs. Thus we are able to correct the data, given in Bulletin No. 101, relating to European fig ashes.

The following small table gives the amounts, in pounds, of vital soil ingredients extracted by the different fruit crops (for fruit alone) that will have to be replaced by fertilization. Bulletin No. 101 gives more data relating to European fruit than we need for the present discussion.

SOIL INGREDIENTS EXTRACTED BY DIFFERENT FRUIT CROPS.

FRUITS.	Total Ash, lbs..	Potash, lb.,....	Phos. Acid, lbs.	Nitrogen, lbs..
FIGS.				
*Europe—				
In each 1000 lbs.....	8.00	3.89	.89	2.27
Crop of 15,000 lbs.....	120.00	58.35	13.35	34.05
California (White Adriatic)				
In each 1000 lbs.....	7.81	4.69	.86	2.38
Crop of 15,000 lbs.....	117.15	70.45	12.90	35.70
GRAPES.				
Europe—				
In each 1000 lbs.....	8.8	5.00	1.52	1.70
CALIFORNIA APRICOTS.				
In each 1000 lbs.....	4.91	2.90	.64	1.94
Crop of 30,000 lbs.....	147.30	87.00	19.20	52.20
CALIFORNIA PRUNES.				
In each 1000 lbs.....	4.86	3.10	.68	1.62
Crop of 30,000 lbs.....	145.80	93.00	20.40	48.60
CALIFORNIA ORANGES.				
In each 1000 lbs.....	4.32	2.11	.53	1.83
Crop of 20,000 lbs.....	56.40	42.20	10.60	36.60

*Imported—analyzed at this station.

With the exception of the grape, it seems that the fig draws rather more heavily upon the mineral ingredients that will need to be replaced by fertilization than do any of the other fruits we have examined; following closely the amounts taken up by the grape and fig of foreign growth. As compared with the fig, apricots and prunes, like oranges, do not in any case draw nearly so heavily upon the mineral matters; lemons and plums, however, very nearly approach it. And among the figs we note that the White Adriatic stands somewhat above the other figs in this respect. As to nitrogen, it is readily seen that among our fruits the figs, on the whole, draw decidedly the highest amount and are quite like those of foreign production in this regard. Here, again, the White Adriatic appears to lead.

Potash.—In the ashes of the fig, as in the prune, apricot, orange and lemon, we find potash to be the leading ingredient, amounting to about three-fifths of the whole ash. From the partial ash analysis, given above, of the imported Smyrna fig, we find the potash to be four-fifths as much as is contained in the ashes of figs of California growth. We may, however, say for the fig, as for other California fruits, that although potash constitutes so large a portion of the ash of these fruits, its replenishment to the soil will be delayed long beyond the addition of other fertilizing ingredients, because most California soils are naturally so well stocked with it that available

A.—PROXIMATE ANALYSES.

Date
PHYSICAL ANAL.

* Not enough fruit for these determinations. † Thirty grams are equivalent to one ounce.

B-ANALYSIS OF THE ASH.

*Analyzed at this Station.

ANALYSES OF SOILS.

ASIA MINOR.		CALIFORNIA.																			
A.		Soil, Erbeili District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
B.		Soil, Erbeili District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
C.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
D.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
E.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
F.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
G.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
H.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
I.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
J.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
K.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
L.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
M.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
N.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
O.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
P.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
Q.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
R.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
S.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
T.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
U.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
V.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
W.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
X.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
Y.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
Z.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AA.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AB.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AC.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AD.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AE.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AF.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AG.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AH.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AI.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AJ.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AK.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AL.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AM.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AN.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AO.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AP.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AQ.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AR.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium; Eisen Vineyard, Fresno Co.....		No. 1159; Soil, Twelve Inches; Experiment Station, near Tulare City.....		No. 971; Soil, Twelve Inches; Mountain View, Santa Clara Co.....		No. 972; Subsoil 971; Twelve to Twenty-four Inches.....		No. 110; Soil, Putah Valley; Dixon, Solano Co.....		GRANITE SOILS.		PLACER COUNTY.	
AS.		Soil, Erbeili, Aidin District.....		Soil, Erbeili, Aidin District.....		No. 1466; Soil, Twelve Inches; S. W. 1/4, S. 17, T. 26 S. R., 23 E., Miramonte, Kern Co.....		No. 570; Soil, Fancher Creek Alluvium													

potash for the current demand will be adequately supplied for many years.

It will be noted below in the soil discussion that the average percentages of potash for both California and Asia Minor soils is nearly identical.

Phosphoric Acid.—The fig, like the lemon, appears to range a little below the other fruits in its draft upon this material, for we find the ashes to stand in the following order in their phosphoric acid percentages, viz., prunes 14.1, apricots 13.1, oranges 12.4, and lemons and figs 11.1. The European data relating to this subject give for phosphoric acid a figure about the same as that we have obtained for our figs. Since our soils usually contain a very limited supply of phosphoric acid, on the average only about one-fourth that given below for Asia Minor soils, our fig, as well as prune, apricot and orange orchards, will require *phosphatic* fertilizers first.

Nitrogen.—As above stated, the fig leads among our fruits in its demand upon the soil for this substance, apricots only coming near it in this respect.

Thus we find that, for the southern localities especially, the same necessity of early replacement of nitrogen in the fig and stone fruit as for orange orchards, and partly for the same reason, viz., that California soils are usually not rich in their natural supply of this substance; however, they contain about double that found in the Asia Minor soils, as indicated by the *humus*. Of the other ash ingredients, *lime* in the fig ranges about twice that in the prune and three times that in the apricot, while the orange and lemon show some 2.5 to 3 times more. As our soils usually contain plenty of lime, even for oranges, only in exceptional cases would there be any necessity of replacing this ingredient by fertilization.

Soils.

It is not our purpose to make a complete discussion of fig soils, but merely to present the analyses of the soils from the Asia Minor districts whence comes the Smyrna fig of commerce; and, by way of comparison, we give some analyses of typical soils from different regions in this State where fig culture seems to succeed.

With the exception of the analysis of soil No. 1466, from Miramonte, Kern Co., published here for the first time, all the descriptions, analyses, etc., of the California soils are taken from previous reports of this station.

Unfortunately, we have for the Asia Minor soils no data regarding the area which each soil analyzed represents, the depth of the soil, distance to water, the natural growth, etc.

ASIA MINOR SOILS.

A. Soil from Smyrna, Asia Minor, received at the University May, 1891, with some fig cuttings, imported by the U. S. Department of Agriculture—a calcareous loam, dark gray in color; somewhat plastic on wetting and kneading; contains fragments of limestone, together with considerable fine quartz gravel.

B. Soil from Erbeili, Asia Minor, said to grow the finest commercial figs. Sample sent by Geo. C. Roeding, Fresno, Cal. This is a micaceous sandy soil, of light buff tint, does not become plastic on wetting and kneading, and consists almost entirely of fine earth. It shows effervescence with acids.

C. Soil from Erbeili, Aidin district, Asia Minor. Sample sent by D. Van Lennop, Auburn, Cal. A sandy, gravelly loam, light color; showing no plasticity upon wetting and kneading. The soil contains quite a large amount of coarse gravel, and does not effervesce upon the addition of acids.

It will be seen from an inspection of the analyses of the Asia Minor soils that they are all exceedingly well supplied with lime and phosphoric acid, and in the case of soil B from Erbeili district, notably also with potash. This latter soil appears, apart from the humus contents, to be the richest, with its 1.09 per cent of potash, 1.96 of lime and .29 per cent of phosphoric acid. It does not contain as much lime and phosphoric acid as soil A, which shows 4.44 and .37 per cent respectively, but the potash percentage is just double that found in soil A, and figs draw quite heavily on this very important ingredient. Soil B. has another very striking advantage over both soils A and C, in that while they have 35 and 40 per cent respectively of coarse materials, soil B has only one per cent of these.

The percentages of potash and lime in soil C are somewhat below those of the other two; while in phosphoric acid it rates the same as B.

When comparing the nitrogen contents as indicated by the humus percentages, we note a marked deficiency in soil B, with only .27 per cent. The figure for soil C, .44, about 1½ times that of soil B, is only fair; and in soil A, showing nearly three times as much humus as does soil B, is satisfactory.

The moisture absorption is low in both soils B and C and only fair in soil A. The higher factor in A was to be expected, owing to its rating so much ahead of the other two in humus.

CALIFORNIA SOILS.

No. 1466. *Sandy loam* soil from S. W. ¼ Sec. 17, T. 26 S. R. 23 E., Miramonte, Kern Co. Sent by Geo. A. Raymond. Consists almost entirely of fine earth. Original vegetation, tar weed and pepper cress. It is of a dark buff tint, becoming somewhat plastic on wetting and kneading. Mr. Raymond writes, under date of September, 1890, regarding this soil:

"Top soil of a fine fig orchard, a quite large streak running from S. E. to N. W. and comprising about 200 acres. Everything does well in this soil, even when new and without previous cultivation. The growth of weeds last spring was tremendous. The figs (White Adriatic) are now in the third year from the nursery, with trunks from four to six inches in diameter and corresponding tops. The trees have made a heavy growth this year, though setting but little fruit. The soil bakes hard when flooded, but is tillable when moist."

The analysis of this soil shows it to contain high percentages of potash, lime and phosphoric acid, the latter approaching very nearly to three times the average for California soils. The nitrogen as indicated by the humus is in a fair supply.

No. 1159. "*Sandy soil* from the Experiment Station tract near Tulare City, of a buff tint, quite sandy, not assuming any plasticity on wetting and kneading, and capable of tillage at all times. Originally timbered with scattering but large white oaks. Sample taken to the depth of 12 inches; at 18 to 20 inches the color changes slightly toward yellowish, but texture

continues unchanged; at 36 inches to 40 inches there underlies a more compact material or hardpan, fairly coherent and of somewhat finer texture, preventing leachiness. Effervesces with acid."

This soil, as may be seen from the analysis given in the table below, is rich in potash and lime; contains an adequate supply of phosphoric acid. It is very low in humus in the the spot sampled, but doubtless this is not the case throughout, judging from the appearance of the land. Its high percentage of soda tells of the vicinity of alkali spots. So far as can be judged this soil is fairly representative of the higher portion of the sandy plains generally from Kern to Stanislaus county.

No. 570. *Alluvial soil*, 12 inches; Eisen vineyard, Fresno Co.; reddish-brown, only moderately heavy, with much coarse sand intermixed; easily tilled, except when very wet. This soil represents the alluvium of the minor streams heading in the foothills. The phosphoric acid in this soil is very low, but this deficiency is in some respects modified by the great depth and perviousness of the soil. The supply of lime is abundant and that of potash above the average.

Nos. 971, 972. *Dark gravelly loam soil and subsoil*, from vineyard and orchard of Mr. J. Sladky, Mountain View, Santa Clara Co., Cal. The soil is a mouse-colored clay-loam, intermixed with a good deal of gravel, some of the latter quite coarse, and both rounded and angular. The lumps of dry soil can be crushed between the fingers with some difficulty, and on wetting it becomes only moderately adhesive.

This soil represents the extreme western edge of the sloping, gently rolling plain that forms the western portion of the Santa Clara valley, southward of Mountain View. Along the streams the soil is of great depth, sometimes showing hardly a perceptible change for 12 or 15 feet in depth, and the roots of trees are found penetrating freely to such depths in the gravelly material. This great depth, perviousness and perfect drainage would constitute alone no mean advantage if the soil were only of moderate fertility. But the analyses show a very good supply of plant food. The potash, lime and humus are high, and the phosphoric acid is found in very fair amounts. It is true that these percentages apply to only one-half of the soil mass, the rest being gravel. But the great depth and easy permeability of the soil more than make up the difference in comparison, *e. g.*, with an adobe soil of similar composition.

These soils may be considered as well adapted to the production of almost any fruit consistent with the local climate.

No. 110. *Soil of Putah Valley*, near Dixon, Solano county, sent by Mr. J. M. Dudley from the "middle land" of the plain, on the slopes of the swales, about three feet above the lowest land. Depth taken, 12 inches. The soil is representative of the rich alluvial plains of Yolo and Solano counties, the soils of which are of pre-eminent fertility, being a mixture of the finest natural sediments of the Sacramento river with those carried by the streams heading in the volcanic portion of the Coast Range (of which Cache and Putah creeks are the chief). The plain is scarcely broken by the slight swales or undulations coming down from the foothills; but the region is thickly settled and is largely occupied by orchards and vineyards.

The analysis of this soil confirms the experience stated above relating to the fertility of the soils of this section. The amount of potash is large and those of lime and phosphoric acid adequate.

No. 766. *Granite soil*, from near Loomis (formerly Pino station,) C. P. Railroad, Placer Co.; sent by E. W. Maslin of Sacramento, who thus describes the soil: "There are about 80 square miles of such land lying between Boulder ridge and the North Fork of the American river and between Roseville on the south and Auburn ravine on the north. The ground is gray when dry; when damp, brown or reddish. In places the soil is from 9 to 10 feet deep; in some places not over one foot. The subsoil also varies in depth and character. On the hills the subsoil rests on a red, rotten granite, into which the roots of trees and shrubs penetrate. It has been dug with the pick to the depth of 20 feet. In the valleys there underlies a gritty clay, here called 'cement,' but also penetrable by roots. Water is within 10 to 12 feet of the surface of the hills in summer. The natural growth is live oak, white oak, digger and nut pine, chaparral 8 to 10 feet high, abundance of poison oak and California holly."

"The growth of the fig tree is very satisfactory. I do not irrigate, and my observation is, that the fig tree as a *producer* of first-class figs does better in the foothills than in the valley. Where the soil is too rich the tree is apt to overgrow and go to wood instead of fruit."

The hill soil, which seems to be a typical one, is a reddish-gray sandy loam, the sand mostly coarse, and consisting largely of granitic debris; it should till easily at all times. The subsoil below the depth of 12 inches is somewhat lighter colored and more sandy. The soils from the depression or valleys seem to differ from the hill land mainly in being somewhat heavier and also of a darker tint.

No. 764. *Valley soil* from same locality as No. 766; a brownish dun-colored, rather sandy loam, darkening materially on wetting and becoming but slightly plastic. Contains much coarse granitic debris. Sample taken to depth of 12 inches.

The subsoil of this land is more reddish and somewhat sandier than the surface soil, the sand being decomposed micaceous granite, increasing downward. Beneath the subsoil at depths varying from 3 to 10 feet is a porous, sandy hardpan (cement) quite coherent from clayey binding material and not readily penetrable by roots. Beneath this comes "rotten" granite (sometimes to 20 feet depth) in which the feldspar masses are kaolinized.

These two granite soils show the usual large amount of inert material (granitic sand or debris) which naturally depresses the plant food percentages. The valley soil differs from that of the ridges, as might be expected, in somewhat higher percentages of lime—of which substance, however, there is enough in both—and of phosphoric acid, of which the supply is small in both, and will doubtless be the first deficiency to be supplied. Potash is present in adequate amounts, and humus is in fair supply, especially in the valley soil, causing the higher absorption of moisture as compared with the ridge soil. In both, however, that factor is low, hence irrigation would doubtless be very beneficial to the thrifty growth of the crops. The somewhat slow progress of vines and trees in the granitic soils of the foothills is at many

points a matter of popular remark and complaint.

No. 51. *Red surface soil* from near Auburn, Placer Co., taken 12 inches deep; sent by Mr. N. S. Prosser of Auburn; original vegetation, oak, pine, manzanita and chaparral.

This is a fair sample of the red soil of the placer mines, which seems to contain a small amount of gold everywhere, and has been washed on a small scale ever since the discovery of gold in California. It is of a dark orange color, rather light in tillage, and pulverulent when dry, forming a very fine reddish dust. It contains throughout numerous fragments of slate, more or less decomposed, of all sizes, and is usually underlaid by the same, or its debris, at a variable depth, rarely less than several feet, unless lying on steep slopes. The soil becomes slightly plastic on wetting, and can be worked soon after rains; its color darkens considerably on wetting. When dry, its lumps are easily crushed between the fingers.

The Auburn soil—a typical slate one—differs from the granitic soils of Pino in one very essential respect—it has on the ridge land over five times as much phosphoric acid as the soil and four times as much as the subsoil, derived from the granite. In other respects it does not differ widely except that it contains much less inert matter as indicated by the insoluble matter. But its well-known high production, both in quantity and quality, and its thriftiness confirm the forecast given by the analysis. Practically the same soil prevails near Newcastle and to the southeast of Penryn—all localities noted for the production of fine shipping fruits.

TABLE OF SOIL ANALYSES.—(See page 5.)

The comparison of the analyses of the Asia Minor soils with those from this State shows very strikingly the richness in phosphoric acid of the former over the latter. The lowest percentage of this ingredient in the Asia Minor soils, .29 found in Soil B, is more than one and one-third times as much as the highest, .22 shown in soil No. 1466 from Miramonte, of the California soils, and the average, .32 per cent of the

three Smyrna soils, is almost exactly four times the average for *all* California soils examined (about 200 in number) and nearly three times the figure .113, denoting the average of phosphoric acid for 466 soils of the humid region (east of the Rocky mountains) of the United States.

With reference to lime, the average for the Asia Minor soils is 2.60 as against 1.08 for California. The figures .690 for Asia Minor and .644 for California, representing the averages for potash, show that both sets of soils are about equally well supplied with this element of plant food.

A marked difference, in favor of California soils, is at once seen when the humus percentages are compared. The average for the Asia Minor soils is only .47, being less than one-half that, 1.08 per cent, found for the average of 198 California soils.

Below is a tabular view of the averages just discussed:

AVERAGE PERCENTAGES OF THE IMPORTANT INGREDIENTS IN SOILS OF ARID AND HUMID REGIONS.

SOIL INGREDIENTS.	Arid.		Humid.
	California—Average of 198 soils..	Asia Minor—Average of 3 soils....	United States East of Rocky Mountains; average of 466 soils.....
Potash.....	.644	.690	.216
Lime.....	1.078	2.600	.108
Phosphoric Acid.....	.083	.320	.113
Humus.....	1.040	.470	2.390

The above little table conveys a forcible illustration of an arid region showing far greater amounts of potash and lime in its soils than does a humid one.

M. E. JAFFA,
GEORGE E. COLBY.

Berkeley, June 22, 1893.